IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF APPEALS

Re Application: ELECTRONIC BALLAST CATHODE HEATING CIRCUIT
Inventor: Ole K. Nilssen
Serial Number: 07/579,569
Filing Date: 09/10/90

Art Unit: 2502
Examiner: SON DINH

Applicant's Phone Number: 708-658-5615

I, OLE K. NILSSEN, HEREWITH CERTIFY THAT THE DATE OF DEPOSIT WITH THE U.S. POSTAL SERVICE OF THIS PAPER OR FEE IS: 6-19-92

REPLY BRIEF

Commissioner of Patents and Trademarks
Washington, D.C. 20231

In response to Examiner's Answer to Applicant's Appeal Brief, Applicant provides a Reply Brief in the form of the following comments.

IN THE CLAIMS

As a result of Examiner's new ground of rejection, Applicant amends his claims.

The amended claims are provided by way of the enclosed four-page document entitled APPENDIX RE-AMENDED CLAIMS on Appeal in Serial No. 07/579,569.

REMARKS

Applicant did not receive a copy of Cox's patent No. 3,691,450; which patent was not previously of record.

However, although merely in the interest of expediting instant prosecution, Applicant takes Examiner's position regarding suggestions by Cox at face value.

In regard to amended claim 1, Applicant has provided additional recitation specifying a feature of the current flowing through a transistor in the source; which current is illustrated in Fig. 3C.

This particular feature is neither described nor suggested by any of the cited references.

In regard to amended claim 11, and with reference to Fig. 2, Applicant has provided additional recitation specifying a feature associated with the fact that the magnitude of the DC voltage supplied to the half-bridge inverter of Fig. 2 is -- with 120 Volt AC power line voltage being provided between terminals 33 and 37 -- is of magnitude higher than (actually about 320 Volt) the peak magnitude of the 120 Volt AC power line voltage (actually about 160 Volt). (See third paragraph at page 4 of the specification)

This particular feature is neither described nor suggested by any of the cited references.

In regard to amended claim 19, and with reference to Fig. 2, Applicant has provided additional recitation specifying a feature associated with the fact -- with 120 Volt AC power line voltage applied betweent terminals 33 and 37 -- the peak-to-peak magnitude of the inverter's output voltage (i.e., about 320 Volt -- see the voltage depicted by Fig. 3A) is about equal to the peak-to-peak magnitude of the 120 Volt AC power line voltage (i.e., about 320 Volt).

This particular feature is neither described nor suggested by any of the cited references.

In regard to amended claim 25, and with reference to Figs. 2 and 6, Applicant has provided additional recitation specifying a feature associated with the fact that -- due to reduced voltage across load 26" after lamp ignition, which results in less current flowing through toroid heater 81, which results in less heating of the toroids of Fig. 2, which results in lower inverter operating frequency -- "the fundamental frequency of the AC voltage" provided from the inverter means is "higher prior to lamp ignition as compared with after lamp ignition". (See first paragraph at page 9 of the specification)

This particular feature is neither described nor suggested by any of the cited references.

APPENDIX

RE-AMENDED CLAIMS on Appeal in Serial No. 07/579,569

1. (Twice Amended) An arrangement comprising:

a source providing an alternating voltage across a pair of source terminals; the alternating voltage having a fundamental period and a fundamental frequency; the source including a periodically conducting transistor through which a forward transistor current flows for only a brief duration once during each fundamental period; the brief duration being substantially shorter than half the duration of the fundamental period;

a series-combination of an inductor and a capacitor; the series-combination being: (i) naturally resonant at a frequency lower than said fundamental frequency, (ii) effectively connected across the source terminals, thereby to draw a source current from the source terminals, and (iii) connected in circuit with a pair of output terminals across which is provided a substantially sinusoidal output voltage; the inductor means being coupled with an auxiliary winding, thereby to cause an auxiliary voltage to be provided from this auxiliary winding; and

a gas discharge lamp means having a first thermionic cathode with a pair of cathode terminals connected with the auxiliary winding by way of a connect means; the lamp means also having a second thermionic cathode; the substantially sinusoidal output voltage being applied between the first and the second thermionic cathodes.

2. The arrangement of claim 1 wherein the coupling between the inductor and the auxiliary winding is sufficiently loose so that, in case an electrical short circuit were to be placed across the auxiliary winding, the magnitude of the source current would be prevented from increasing to a detrimentally high level.

3. The arrangement of claim 1 wherein the coupling between the inductor and the auxiliary winding is sufficiently loose so that, in case an electrical short circuit were to be placed across the auxiliary winding, the inductance represented by the inductor would not decrease by more than half.

4. The arrangement of claim 1 wherein the connect means includes resistor means.

5. The arrangement of claim 4 wherein the resistor means is a non-linear resistor means.

6. The arrangement of claim 4 wherein the resistor means includes an incandescent filament means.

7. The arrangement of claim 1 wherein the connect means includes limiting means operative to manifestly limit to a pre-established level the magnitude of any current drawn from the auxiliary winding.

8. The arrangement of claim 1 wherein the source includes frequency-converting power supply means operative to be powered from the power line voltage of an ordinary electric utility power line and to provide said alternating voltage; the fundamental frequency of the alternating voltage being substantially higher than that of the power line voltage.

9. The arrangement of claim 1 wherein the magnitude of the source current is an inverse function of the magnitude of the inductance of the inductor.

10. The arrangement of claim 1 wherein the series-combination is naturally resonant at a frequency lower than said fundamental frequency.

11. (Twice Amended) An arrangement comprising:

a source of power line voltage;

rectifier means connected with the source and operative to provide a substantially constant DC voltage at a set of DC terminals; the absolute magnitude of the DC voltage being substantially higher than the peak absolute magnitude of the power line voltage;

inverter means connected with the DC terminals and operative to provide an AC voltage across a pair of inverter terminals;

an LC circuit having a tank inductor connected with a tank capacitor; the LC circuit being: (i) connected in circuit with the inverter terminals, (ii) tuned to natural resonance at a frequency equal to or lower than the fundamental frequency of the AC voltage, (iii) operative to draw an inverter current from the inverter terminals, and (iv) connected in circuit with a pair of output terminals across which is provided a substantially sinusoidal output voltage; the inductor means having a main winding and an auxiliary winding coupled therewith; and auxiliary voltage being provided by the auxiliary winding; and

a gas discharge lamp means having a pair of cathode terminals connected with the auxiliary winding.

12. The arrangement of claim 11 wherein the main winding: (i) has an inductance of a first magnitude when no current is flowing in the auxiliary winding; (ii) has an inductance of a second magnitude when a short circuit is present across the auxiliary winding; and (iii) the second magnitude is at least half of the first magnitude.

19. (Twice Amended) An arrangement comprising:

a source of power line voltage;

rectifier and filter means connected with the source an operative to provided a DC voltage across a pair of DC terminals; the DC voltage being of substantially constant magnitude;

a half-bridge inverter [means] connected with the DC terminals [a source of DC voltage] and operative to supply an AC voltage at an inverter output; the peak-to-peak magnitude of the AC voltage being substantially equal to that of the power line voltage;

an L-C circuit having an inductor means and a capacitor means; the L-C circuit: (i) being connected in circuit with the inverter output, (ii) having a natural resonance frequency lower than the fundamental frequency of the AC voltage, and (iii) having a set of output terminals at which is provided a substantially sinusoidal output voltage; the capacitor means being effectively connected across the output terminals; the inductor means having a main winding and at least one auxiliary winding magnetically coupled with the main winding; the at least one auxiliary winding having a pair of auxiliary terminals across which is provided an auxiliary voltage; and

gas discharge lamp means having lamp terminals connected in circuit with the output terminals; the gas discharge lamp means having at least one thermionic cathode having a pair of cathode terminals connected with the axiliary terminals;

whereby the thermionic cathode is provided with cathode heating power from the auxiliary winding.

20. The arrangement of claim 19 wherein: (i) the inverter output includes a pair of inverter output terminals; and (ii) the inductor means and the capacitor means are in effect series-connected across the inverter output terminals.

21. The arrangement of claim 19 wherein the waveform of the AC voltage is substantially different from the waveform of the output voltage.

22. The arrangement of claim 19 wherein: (i) the AC voltage has a non-sinusoidal waveform; and (ii) the current flowing through the inductor has a substantially sinusoidal waveform.

23. The arrangement of claim 19 wherein: (i) the AC voltage has a non-sinusoidal waveform while the output voltage has a substantially sinusoidal waveform.

24. The arrangement of claim 19 wherein: (i) the output voltage has an RMS magnitude; (ii) the gas discharge lamp may be disconnected from the output terminals; and (iii) the RMS magnitude is substantially lower when the gas discharge lamp is connected with the output terminals as compared to when it is not so connected.

25. (Amended) An arrangement comprising:

an L-C circuit having a tank inductor means and a tank capacitor means; the L-C circuit including: (i) a set of L-C circuit input terminals, (ii) a natural resonance frequency, and (iii) a set of L-C circuit output terminals; the tank inductor means having a main winding and at least one auxiliary winding magnetically coupled with the main winding; the at least one auxiliary winding having a pair of auxiliary terminals;

inverter means connected with a source of DC voltage an operative to supply an AC voltage at a set of inverter output terminals; the inverter output terminals being connected with the L-C circuit input terminals; the fundamental frequency of the AC voltage being, at least at times, higher than said natural resonance frequency; the AC voltage supplied to the L-C circuit input terminals being operative to cause a substantially sinusoidal output voltage to be provided at the L-C circuit output terminals; and

gas discharge lamp means having a pair of lamp terminals connected with the L-C circuit output terminals; the gas discharge lamp means having at least one thermionic cathode having a pair of cathode terminals connected with the axiliary terminals;

the arrangement being characterized by the fundamental frequency of the AC voltage being higher prior to lamp ignition as compared with after lamp ignition.

26. The arrangement of claim 25 wherein the tank capacitor means is connected across the L-C circuit output terminals.